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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
OWENS, DOUGLAS W	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/903,160	BASCERI ET AL.	
	Examiner	Art Unit	
	Douglas W Owens	2811	

-- The MAILING DATE of this communication appears on the cover sh et with th correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 July 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-13,15-19,21-29 and 38-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *9 – 13, 15 – 19, 21, 29, 38 – 41, 43 and 44* is/are allowed.

6)☒ Claim(s) *1 – 3, 5, 6, 8, 22, 23, 25, 26, 28 and 42* is/are rejected.

7)☒ Claim(s) *4,24 and 27* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claim 42 is rejected under 35 U.S.C. 102(a) as being anticipated by US patent No. 6,251,720 to Thakur et al.

Thakur et al. teaches a method for forming a capacitor comprising:

providing a non-oxide electrode (104; Fig. 1A, for example);

oxidizing an upper surface of the non-oxide electrode (Col. 8, lines 20 – 24);

depositing a high dielectric constant oxide dielectric material (102; Col. 9, lines 21 – 33) directly onto the oxidized surface (122) of the non-oxide electrode; and

depositing an upper layer electrode (106) on the high dielectric constant material.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1 – 3, 5, 6, 8, 22, 23, 25, 26 and 28 rejected under 35 U.S.C. 103(a) as being unpatentable over US patent No. 6,251,720 to Thakur et al.

Regarding claims 1 and 2, Thakur et al. teaches a method for forming a capacitor comprising:

providing a non-oxide electrode (104; Fig. 1A, for example);

oxidizing an upper surface of the non-oxide electrode (Col. 8, lines 20 – 24);

depositing a high dielectric constant oxide dielectric material (102; Col. 9, lines 21 – 33) directly onto the oxidized surface (122) of the non-oxide electrode; and

depositing an upper layer electrode (106) on the high dielectric constant material.

Thakur et al. further teaches using an O_2 or N_2O gas to form the oxide. Thakur et al. does not teach using an O_3 plasma. It would have been obvious to one of ordinary skill in the art to select an O_3 plasma to form the oxide since it is a known gas that is well suited for the intended use.

Regarding claims 3 and 8, Thakur et al. teaches a method wherein the oxidation is carried out at a temperature in the range of 100 to 950 degrees Celsius (Col. 8, lines 45 – 52), which overlaps the claimed range of 250 to 700 and 250 to 500 degrees Celsius. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990).

Regarding claims 5 and 28, Thakur et al. teaches a method, wherein the high dielectric constant oxide is Ta_2O_5 (Col. 9, lines 29 – 33). It would have been obvious to one of ordinary skill to select Al_2O_3 or $Ba_xSr_{(1-x)}TiO_3$, since they are known materials that are well suited for the intended use.

Regarding claim 6, Thakur et al. teaches that the upper surface is oxidized prior to the deposition of the high dielectric constant material. Thakur et al. does not explicitly teach that the oxidation is performed in an oxide deposition chamber. It would have been obvious to one of ordinary skill in the art to perform the oxidation in an oxidation deposition chamber since it is desirable to have a controlled environment so the oxide growth can be controlled.

Regarding claim 22, Thakur et al. teaches a method for forming a capacitor comprising:

providing a non-oxide electrode;

oxidizing an upper surface of the non-oxide electrode;

depositing a high dielectric constant dielectric material directly onto the oxidized surface of the non-oxide electrode; and

depositing an upper electrode.

Thakur et al. does not explicitly teach that the oxidation is performed in an oxide deposition chamber. It would have been obvious to one of ordinary skill in the art to perform the oxidation in an oxidation deposition chamber since it is desirable to have a controlled environment so the oxide growth can be controlled.

Thakur et al. does not teach depositing the high dielectric constant material in the same deposition chamber. It would have been obvious to one of ordinary skill in the art to leave the device in the controlled environment of the deposition chamber for depositing the high dielectric constant material, since it is desirable to reduce the

number of process steps as well as minimizing the risks of contaminating the device during fabrication.

Regarding claims 23 and 26, Thakur et al. teaches a method for forming a capacitor comprising:

providing a non-oxide electrode;

oxidizing an upper surface of the non-oxide electrode in an atmosphere containing O_2 or N_2O;

depositing a high dielectric constant dielectric material directly onto the oxidized surface of the non-oxide electrode; and

depositing an upper electrode.

Thakur et al. further teaches a method wherein the oxidation is carried out at a temperature in the range of 100 to 950 degrees Celsius (Col. 8, lines 45 – 52), which overlaps the claimed ranges of 250 to 700 and 250 to 500degrees Celsius.

Regarding claim 25, Thakur et al. teaches a method for forming a capacitor comprising:

providing a non-oxide electrode (104; Fig. 1A, for example);

oxidizing an upper surface of the non-oxide electrode (Col. 8, lines 20 – 24) in an atmosphere containing O_2 or N_2O;

depositing a high dielectric constant oxide dielectric material (102; Col. 9, lines 21 – 33) directly onto the oxidized surface (122) of the non-oxide electrode; and

depositing an upper layer electrode (106) on the high dielectric constant material.

Thakur et al. does not teach a gas plasma. It would have been obvious to one of ordinary skill in the art to use a plasma since it is a known material that is well suited for the intended use. Plasma is commonly used in the art to oxidize surfaces.

Allowable Subject Matter

5. Claims 4, 24 and 27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. Claims 9 – 13, 15 – 19, 21, 29, 38 – 41, 43 and 44 are allowed.

The most closely related art, US patent No. 6,251,720 to Thakur et al. teaches away from oxidizing the lower electrode when a metallic layer is used for the bottom plate electrode (Col. 11, lines 33 – 37).

Response to Arguments

7. Applicant's arguments filed July 18, 2003 have been fully considered but they are not persuasive.

The Applicant argues that Thakur et al. does not teach oxidizing a non-oxide electrode and depositing a high dielectric constant insulator on the oxidized surface. This teaching can be found in lines 18 – 24 of column 8, and more specifically in lines 65 – 67 of the same column, where Thakur et al. teaches that "...barrier layer 122 (Si_3N_4, **SiO_2**, GeO_2, or GeN_4) is needed between the bottom plate electrode 104 and the **HDC capacitive dielectric**..." (emphasis added).

The Applicant argues that the claimed invention is patentable over Thakur et al. because Thakur et al. does not use O_3 plasma to form the oxide. The use of O_3 plasma for forming oxide layers is well known in the art as evidenced below:

US Published Patent Application 2001/0041413 to Adachi (See Paragraph [0057]
US Patent No. 6,391,801 to Yang (Col. 4, lines 9 – 16)
US Patent No. 6,303,449 to Pan et al. (Col. 3, lines 47 – 57)

It is considered obvious to use known and commonly used methods of forming oxides, since it is a reliable and proven method that has industry wide acceptance.

The Applicant argues that the claimed invention is patentable over Thakur et al. because Thakur et al. does not explicitly teach forming the oxide and depositing the high dielectric constant material in the same deposition chamber. As stated above, it would have been obvious to one of ordinary skill in the art to leave the device in the controlled environment of the deposition chamber for depositing the high dielectric constant material, since it is desirable to reduce the number of process steps as well as minimizing the risks of contaminating the device during fabrication. An additional step of moving the lot of wafers from the oxidation chamber to a separate chamber for depositing the high dielectric constant material would have resulted in an increase of

processing times, increased labor or equipment cost, increased risk of contamination of the wafers and possibly increased risk of injury depending upon the automation level of the fabrication facility. It would have been obvious to deposit the high dielectric constant material in the same chamber as the oxidation because of reduction of both costs and risks, each of which are industry wide goals that result in increased profits.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Tom Thomas

DWO

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